
**DIPONEGORO UNIVERSITY**

# ASSESSMENT OF INDUSTRIAL ZONES IN SPATIAL PLAN THROUGH THE MODELING OF INDUSTRIAL GROWTH IN SEMARANG METROPOLITAN COAST

## UNDERGRADUATE THESIS

**TIARA IKA FARIHA**

**21040116140052**

**FACULTY OF ENGINEERING**

**DEPARTEMENT OF URBAN AND REGIONAL PLANNING**

**SEMARANG**

**JULY 2020**

**DIPONEGORO UNIVERSITY**

# ASSESSMENT OF INDUSTRIAL ZONES IN SPATIAL PLAN THROUGH THE MODELING OF INDUSTRIAL GROWTH IN SEMARANG METROPOLITAN COAST

## UNDERGRADUATE THESIS

**Submitted as one of the requirements to get a Bachelor's degree**

**TIARA IKA FARIHA**

**21040116140052**

**FACULTY OF ENGINEERING**

**DEPARTEMENT OF URBAN AND REGIONAL PLANNING**

**SEMARANG**

**JULY 2020**

## PAGE OF ORISINALITY STATEMENT

This undergraduate thesis entitled **"Assessment of Industrial Zones in Spatial Plan through The Modeling of Industrial Growth in Semarang Metropolitan Coast"** is my own work, and guided by **Prof. Dr. rer. nat. Imam Buchori, ST** and I have stated all the sources, both cited and referred correctly.

NAME : Tiara Ika Fariha

NIM : 21040116140052

Signature :

Date : July 20, 2020

**ENDORSEMENT PAGE**

This bachelor's thesis is proposed by :

Name : Tiara Ika Fariha

NIM : 21040116140052

Departement : Urban and Regional Planning

Last Assignment Title : "Assessment of Industrial Zones in Spatial Plan through The Modeling of Industrial Growth in Semarang Metropolitan Coast"

It has been successfully defended in front of the Examiner Team and accepted as a necessary requirement for obtaining a Bachelor's degree in the Department of Urban and Regional Planning, Faculty of Engineering, Diponegoro University.

EXAMINER TEAM

Supervisor : Prof. Dr.rer.nat. Imam Buchori, S.T. (.....)

Examiner I : Dr. Anang Wahyu Sejati, S.T., M.T. (.....)

Examiner II : Samsul Ma'rif, S.P., M.T. (.....)

Semarang, 20 July 2020

Knowing,

Head of Undergraduates Program

Departement of Urban and Regional Planning

**Ir. Agung Sugiri, MPSt**

NIP. 196204031993031003

**PUBLICATION AGREEMENT STATEMENT PAGE**
**UNDERGRADUATE THESIS FOR ACADEMIC INTEREST**

---

As an academic community of Diponegoro University, I am the one who signs below :

Name : Tiara Ika Fariha

NIM : 21040116140052

Departement : Urban and Regional Planning

Faculty : Engineering

Type of Work : Undergraduate Thesis

for the sake of scientific development, agreed to give Diponegoro University a Non-exclusive Royalty Free Right for my scientific work entitled :

**"Assessment of Industrial Zones in Spatial Plan through The Modeling of Industrial Growth in Semarang Metropolitan Coast"**

along with the available tools (if needed), with this Royalty/ Non-Exclusive Right, Diponegoro University has the right to store, transfer media/ format, process in a database, maintain and publish my undergraduate thesis while keeping my name as an author/ creator and as the Copyright owner.

This statement I made in truth.

Made in : Semarang

Date : July 20, 2020

Stated by

Tiara Ika Fariha

# ASSESMENT OF INDUSTRIAL ZONES IN SPATIAL PLAN THROUGH THE MODELING OF INDUSTRIAL GROWTH IN SEMARANG METROPOLITAN COAST

Tiara Ika Fariha

## Abstract

Central Java Province has the manufacturing sector as the largest economic contributor of 34.42% with a growth rate of the manufacturing industry sector of 5.19%. The growth of the industrial sector is mainly supported by the infrastructure contained in the northern coast of Central Java Province (Kendal-Semarang-Demak). Strategic location and supported by infrastructure ranging from the North Coast Road, the Trans Java Highway, Ahmad Yani International Airport and Tanjung Emas port increase the industrial growth in this region. However, the high increase in industrial built up area in Semarang Metropolitan Coast has an impact on the conversion of coastal land if the growth cannot be controlled through the implementation of spatial plan. Based on the phenomena and problems that occur related to industrial growth in the Semarang Metropolitan Coast, this research needs to be carried out to identify the direction and trends of industrial growth in 2015-2020 and the growth predictions in 2030 for assessing the industrial zones in spatial plan 2011-2031.

This research consist the estimation of industrial built up area growth using combination of GeOBIA method and manual interpretation of high-resolution satellite imagery (Sentinel-2A) from 2015 to 2020 and assessment of industrial zones in spatial plan based on the industrial growth prediction model in 2030 using the Cellular Automata Markov (CA-Markov). Growth models show an increase of industrial built up area by 294.16 hectares in 2015-2020 and it predicted will be increase of 512.62 hectares in 2020-2030. Industrial built up area tends to growth towards the eastern and western part of Semarang Metropolitan Coast based on map distribution and area growth. Industrial growth on Semarang Metropolitan Coast also has an influence on the increase of 151.32 ha of built up area in 2015 to 2020. In 2020 there are 21.02% of industries that not suitable with spatial plan and predicted will be increased to 28.34% in 2030, it is necessary for government to increase the efforts to control the spatial use.

**Keywords** : Industrial Growth, Coastal Area, GeOBIA, CA-Markov

## PREFACE

Alhamdulillah, by the grace of Allah SWT which has bestowed His mercy and guidance, so the author is given fluency and ease in the preparation of the undergraduate thesis entitled **"ASSESSMENT OF INDUSTRIAL ZONES IN SPATIAL PLAN THROUGH THE MODELING OF INDUSTRIAL GROWTH IN SEMARANG METROPOLITAN COAST"**. The preparation of this undergraduate thesis is inseparable from the support of various parties who have helped directly or indirectly, therefore the author would like to express gratitude to :

1. Both parents, Mr. Dani Ridwana and Mrs. Yeyen Faridah Ariyani; my younger brother, Muhammad Yoga Ridwan; my grandmother, Mrs. Aat Katijah and my aunt Mrs. Zuraidah Anniswati who have provided moral and material support to the writer from the first semester to the completion of this undergraduate thesis preparation,
2. Dr. Ir. Hadi Wahyono, MA, as The Head of Urban and Regional Planning Departement, Engineering Faculty, Diponegoro University,
3. Ir. Agung Sugiri, MPst as The Head of Undergraduates Program of Urban and Regional Planning Departement, Engineering Faculty, Diponegoro University,
4. Prof. Dr.rer.nat. Imam Buchori S.T. as supervisor lecturer which has provided guidance and increased insight during the process of preparing this undergraduate thesis,
5. Dr. Anang Wahyu Sejati, S.T., M.T. as a examiner lecturer who has given advice and increased insight to improve this undergraduate thesis,
6. Samsul Ma'rif, S.P., M.T. as a examiner lecturer who has given advice and increased insight to improve this undergraduate thesis,
7. Rukuh Setiadi, S.T.,MEM.,Ph.D. as a guardian lecturer who has provided direction and guidance since the author became a student in Department of Urban and Regional Planning,
8. The entire Lecturer Team of the Urban and Regional Planning who have provided learning and guidances,
9. Head of Sub-Directorate of Strategic Areas and Staff of Sub-Directorate of Strategic Areas who have provided a lot of insights as long as the authors carry out practical work in the Ministry of National Development Planning/ BAPPENAS that has a positive impact for the author in the process of completing this undergraduate thesis,
10. The entire teachers of Al-Kamal Kindergarten, Gelatik Elementary School, Junior High School and Senior High School especially Mrs. Neni Rasunawati, who have provided knowledges and insight,

11. Guidance friend, Abdurrahman Zaki, who had taken the time to discuss and provided much assistance during the preparation of this undergraduate thesis,
12. My best friend Anggun Khairunnisa Putri, Mutiara Lulu Annisa and Annisa Dayanty who always give me encouragement and support,
13. Best friends of "Menantu Idaman", Aldhea Puti Khalisa, Ratu Kusumasindy, Hana Aulia Zamira, Rheza Mustafa Haqqulhuda, Savira Nur Afifah, Dian Apriliana, Regita Sania Nurfachri and Nadiya Tri Utami who have accompanied, assisted, provided motivation, and enthusiasm as well as support from the 1st semester to the present,
14. Friends of the Planning Process Studio and the "Team A2" Urban and Regional Planning Studio who have provided precious experiences during the learning process,
15. All friends of the Department of Urban and Regional Planning of Diponegoro University 2016 who always provides support, motivation, spirit and provide good cooperation,
16. Friends of Community Service Team 1 of UNDIP in Japerejo Village who provided support, motivation and enthusiasm while preparing this undergraduate thesis,
17. The entire Family of Student Council of Engineering Faculty, Diponegoro University, Management Period 2016-2017 and 2017-2018,
18. All parties who have helped in the process of preparing this undergraduate thesis that I cannot mention one by one.

The author realizes that there are still shortcomings in the preparation of this undergraduate thesis. Therefore, the authors expect all forms of criticism and suggestions from readers in order to improving the undergraduate thesis in the future. The author also hopes that this undergraduate thesis could be beneficial for the development of knowledge in the field of Urban and Regional Planning.

Semarang, July 20, 2020

Writer

## TABLE OF CONTENTS

**Abstract** ..... iv
**LIST OF TABLES** ..... ix
**LIST OF FIGURES** ..... x

**CHAPTER I INTRODUCTION** ..... 1
1.1. Introduction ..... 1
1.2. Research Objectives and Targets ..... 2
1.3. The Research Scope ..... 2
1.3.1. The Study Area Scope ..... 3
1.3.2. Substantial Scope ..... 3
1.4. Research Benefit ..... 3
1.5. Research Method ..... 3
1.5.1 Image Classification using GeOBIA ..... 4
1.5.2 Industrial Growth Prediction using CA-Markov ..... 6
1.6. Logical Framework ..... 9
1.7. Data Collection and Analysis Methods ..... 10
1.7.1 Data Collection Techniques ..... 10
1.7.2. Research Data ..... 10
1.7.3. Analysis Techniques ..... 12
1.8. Framework ..... 14
1.9. Systematics Writing ..... 15

**CHAPTER II LITERATURE REVIEW** ..... 16
2.1. The Concept of Industrial Location Growth ..... 16
2.2. The Types of Industries ..... 17
2.3. Industrial Agglomeration ..... 19
2.4. Industrial Estates Planning in Coastal Areas ..... 20
2.5. Spatial Transformation from Industrial Growth ..... 21
2.6. GeOBIA Method in the Context of Urban and Regional Planning ..... 22
2.7. Application of GeOBIA Method in Land Use/ Land Cover Classification ..... 23
2.8. Literature Synthesis ..... 25

**CHAPTER III GENERAL DESCRIPTION** ..... 26
3.1. The Study Area ..... 26
3.2 Industrial Cluster in Semarang Metropolitan Coast ..... 27
3.3 Industrial Zones in Spatial Plan of 2011-2031 ..... 37
3.3.1 Industrial Zones in Kendal Regency Spatial Plan ..... 37
3.3.2 Industrial Zones in Semarang City Spatial Plan ..... 39
3.3.3 Industrial Zones in Demak Regency Spatial Plan ..... 40

**CHAPTER IV IDENTIFICATION AND ANALYSIS** ..... 42
4.1 Identification of Industrial Growth in Semarang Metropolitan Coast 2015-2020 ..... 42
4.2 Analysis of Industrial Growth in Semarang Metropolitan Coast in 2015-2020 ..... 46
4.3 Assessment of Industrial Zone in Spatial Plan based on Industrial Growth 2015-2020 48
4.4 Industrial Growth Prediction in Semarang Metropolitan Coast of 2030 ..... 50
4.5 Assessment of Industrial Zones in Spatial Plan 2011-2031 based on Industrial Growth Prediction in 2030 ..... 52
4.6 Validation and Accuration ..... 55

**CHAPTER V CONCLUSION AND RECOMMENDATION** ..... 57
5.1 Conclusion ..... 57
5.2 Recommendation ..... 58

**ATTACHMENT** ..... 59
**REFERENCES** ..... 66

## LIST OF TABLES

Table 1. 1 The correlation level between variables based on Pearson's Correlation Coefficient ... 7
Table 1. 2 Kappa Index Category ... 8
Table 1. 3 Primary and Secondary Data ... 11
Table 1. 4 Multi-Index Band Composites (NDTI+NDVIre+MNDWI) ... 12
Table 1. 5 Sentinel-2A Band ... 12

Table 2. 1 Industrial Location Criteria ... 18
Table 2. 2 Research related to the use of the GeOBIA Method for land use / land cover detection and building detection ... 24
Table 2. 3 Literature Synthesis ... 25

Table 4. 1 Land Use and Land Cover Classification Results (ha). ... 44
Table 4. 2 Transition Matrix of Semarang Metropolitan Coast Land Cover in 2015-2020 ... 45
Table 4. 3 Industrial Built Up Area in Semarang Metropolitan Coast 2015-2020 (ha) ... 47
Table 4. 4 Industrial Area Suitability in 2020 with Spatial Plan (ha) ... 49
Table 4. 5 Industrial Growth Prediction in 2030 ... 51
Table 4. 6 Industrial Area Suitability in 2030 with Spatial Plan (ha) ... 54
Table 4. 7 Industrial Land Supply Prediction in 2030 (ha) ... 54
Table 4. 8 Land Cover Classification Kappa Index in 2015 and 2020 ... 56

# LIST OF FIGURES

Figure 1. 1 Logical Framework ..... 9
Figure 1. 2 Sentinel-2A Band Composite ..... 11
Figure 1. 3 Research Analysis Framework ..... 13
Figure 1. 4 Framework ..... 14

Figure 3. 1 Map of the Study Area Boundary ..... 26
Figure 3. 2 Map of Industrial Cluster in Semarang Metropolitan Coast ..... 27
Figure 3. 3 Satellite Imagery of Kendal Industrial Park in 2015 and 2020 ..... 28
Figure 3. 4 Satellite Imagery of Kayu Lapis Indonesia in 2015 and 2020 ..... 29
Figure 3. 5 Satellite Imagery of Mangkang Industrial Site in 2015 and 2020 ..... 29
Figure 3. 6 Satellite Imagery of Wonosari Industrial Site in 2015 and 2020 ..... 30
Figure 3. 7 Satellite Imagery of Wijayakusuma Industrial Estate in 2015 and 2020 ..... 31
Figure 3. 8 Satellite Imagery of Guna Mekar Indonesia Industrial Site in 2015 and 2020 ..... 31
Figure 3. 9 Satellite Imagery of Candi Industrial Estate (Northern Area) in 2015 and 2020 ..... 32
Figure 3. 10 Satellite Imagery of Krapyak Industrial Site in 2015 and 2020 ..... 32
Figure 3. 11 Satellite Imagery of Madukoro Industrial Site in 2015 and 2020 ..... 33
Figure 3. 12 Satellite Imagery of Sinar Sentra Cipta Industrial Site in 2015 and 2020 ..... 33
Figure 3. 13 Satellite Imagery of Lamicitra Nusantara in 2015 and 2020 ..... 34
Figure 3. 14 Satellite Imagery of Bandarharjo Industrial Site in 2015 and 2020 ..... 35
Figure 3. 15 Satellite Imagery of Pertamina's Fuel Oil Terminal in 2015 and 2020 ..... 35
Figure 3. 16 Satellite Imagery of Bugangan Baru Small Scale Industrial Area in 2015 and 2020 ..... 36
Figure 3. 17 Satellite Imagery of Terboyo Industrial Park in 2015 and 2020 ..... 36
Figure 3. 18 Satellite Imagery of Sayung Industrial Site in 2015 and 2020 ..... 37
Figure 3. 19 Map of Kendal Regency Spatial Pattern Plan 2011-2031 ..... 38
Figure 3. 20 Map of Kendal Special Economic Zones (SEZ) ..... 38
Figure 3. 21 Map of Semarang City Spatial Pattern Plan 2011-2031 ..... 39
Figure 3. 22 Map of Demak Regency Spatial Pattern Plan 2011-2031 ..... 41

Figure 4. 1 Difference in Results of Land Cover Classification in 2015 and 2020 ..... 42
Figure 4. 2 Land Cover Map of Semarang Metropolitan Coast in 2015 and 2020 ..... 44
Figure 4. 3 Map of Industrial Growth in Semarang Metropolitan Coast in 2015-2020 ..... 47
Figure 4. 4 Suitability Map of Industries with Spatial Plan in 2020 ..... 48
Figure 4. 5 Map of Industrial Growth Prediction in 2030 ..... 51
Figure 4. 6 Spatial Variable ..... 52
Figure 4. 7 Map of Semarang Metropolitan Coast Spatial Pattern Plan ..... 52
Figure 4. 8 Overlay Map of Industrial Growth Prediction in 2030 and Spatial Plan 2011-2031 ..... 53
Figure 4. 9 Difference Result Between Natural Band Composite and Multi-Index Band Composite ..... 55
Figure 4. 10 Observation Point Map in Semarang Metropolitan Coast ..... 56